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(54) SOLID-STATE IMAGE-PICKUP ELEMENT AND SOLID-STATE IMAGE-PICKUP DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent the contents of the upper part of image and the contents of the lower part of a screen from being shiftedeven when an object to be image picked up moves at a high speed by forming image signals by light received at the same time by all pixels.
SOLUTION: Vertical scanning start pulses are inputted to a terminal 2 and the terminal 25vertical scanning pulses are inputted to the terminal 3 and the terminal 21 and thusa first row is selected and signals 20a and 26a become HIGH. Thenthe HIGH pulses are impressed to the terminal 10 and the terminal 24 and the voltage of a diffusion stray capacity 102 for a first line is transferred to the diffusion stray capacity 143. Thenthe signal 20b and the signal 26b become HIGHthen the signal 20c and the signal 26c become HIGH for a second line and the voltage is transferred from the respective diffusion stray capacities 102 to a diffused region 143 for a third line. At the ending of the transferthe transfer of the voltage for the entire pixels is ended. The transfer is executed in a short time since it does not accompany the transfer in a

horizontal direction.

CLAIMS

[Claim(s)]

[Claim 1]A solid state image pickup device comprising:
A photoelectric conversion means which generates an electric charge by photoelectric conversion from light which received light.
The 1st transfer means that transmits said electric charge generated in said photoelectric conversion means.
The 1st memory measure that memorizes said transmitted electric charge.
The 1st output means that outputs potential generated in said 1st memory measure by time sharingTwo or more pixel cells provided with an initializing means which initializes voltage of said 1st memory measure to a predetermined valueA means to operate simultaneously said 1st transfer means of two or more of said pixel cellsA means to operate simultaneously said initializing means of two or more of said pixel cellsand two or more 1st output lines that undergo an output of said pixel cell for every sequenceTwo or more 2nd memory measures that corresponded to an effective pixel cell among said two or more pixel cells 1 to 1A control means which controls two or more 2nd transfer means that transmit selectively each signal of two or more of said 1st output lines to each of two or more of said 2nd memory measures for every sequenceand said 1st transfer meanssaid output means and said two or more 2nd transfer means.

[Claim 2]An optoelectric transducerwherein said 1st transfer means and said initializing means interlock and initialize an electric charge of said photoelectric conversion means in the solid state image pickup device according to claim 1.
[Claim 3]Two or more 2nd output means that output potential of two or more of said 2nd memory measures by time sharing in the solid state image pickup device according to claim 1 or 2A solid state image pickup devicewherein it has further two or more 2nd output lines that undergo an output of two or more of said 2nd output means for every sequence and said control means controls further said two or more 2nd output means.
[Claim 4]The solid state image pickup device comprising according to claim 3:
Two or more 3rd memory measures that memorize a signal of two or more of said 2nd output lines.

The 3rd output line that undergoes an output of two or more 3rd output means that output potential of the 3rd memory measure of this plurality by time sharingand the 3rd output means of this plurality.

[Claim 5]In the solid state image pickup device according to claim 4said 3rd memory measure and said 3rd output means in the same sequence Those with two or moreA solid state image pickup devicewherein said 3rd output line is further provided with two or more 3rd transfer means that transmit selectively each of a signal of those with two or moreand two or more of said 2nd output lines to each of two or more of said 3rd memory measures and said control means controls further said two or more 3rd transfer means.
[Claim 6]A solid state image pickup device having further a difference means to take difference of a signal of two or more of said 3rd output linesin the solid state image pickup device according to claim 5.
[Claim 7]A solid state camera comprising:
The solid state image pickup device according to claim 6.
A strobe light means.

[Claim 8]A solid state camera comprising:
A sensor part by which a photoelectric conversion pixel was arranged at a multi-line.
A memory part which carried out multi-line arrangement of the accumulation means which accumulates a signal from said photoelectric conversion pixel of a multi-line.
A transfer means which transmits a signal from said sensor part to said memory part.
A control means to which a noise signal of said photoelectric conversion pixel corresponding to an accumulation means of said arbitrary blocks is made to output while a picture signal from said photoelectric conversion pixel is outputted from an accumulation means of arbitrary blocks in said memory partand an elimination means which removes said noise signal from said picture signal.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the solid state image

pickup device which outputs the signal of the image lights which enteredand the solid state camera using it. A solid state camera is used for a video camera etc.

[0002]

[Description of the Prior Art]Firstthe solid state image pickup device by the conventional example 1 is explained.

[0003]Drawing 6 is a circuit block figure of the solid state image pickup device by the conventional example 1. The photo-diode as a photo detector which will generate an electric charge by the light into which 101 entered if a figure is referred toThe transistor for transmission for transmitting the electric charge which generated 102 in the floating diffusion region and generated 103 with the photo-diode 101 to the floating diffusion region 102The transistor for reset for 104 to discharge the electric charge accumulated in the floating diffusion region 102The capacitor for memorizing the voltage which generated 105106and 107 to the transistor for amplifierand generated 108 in the floating diffusion region at the time of resetA capacitor for 109 to memorize the voltage generated in the floating diffusion region at the time of operationThe transistor for a switch to which 110 connects amplifier and the capacitor 108The transistor for a switch to which 111 connects amplifier and the capacitor 109The transistor for capacitor discharge for 112 to make the capacitors 108 and 109 dischargeThe transistor for a switch for 113 and 114 switching with 115and a buffer and 116 switching the voltage of the capacitors 108 and 109 with the capacitor of other sequences respectivelyand supplying the buffers 113 and 114The transistor for reset for 117 and 118 to reset the input voltage of the buffers 113 and 114 respectivelyand 119 and 120 A level output line121 is a vertical scanning circuit and 122 is a horizontal scanning circuit. The amplifier which comprises the transistors 105106and 107 works as source follower type amplifieronly when the transistors 106 and 107 are ON. The photo-diode 101the diffusion floating field 102and the transistors 103104105and 106 form one pixel.

[0004]Drawing 7 is a timing chart of the solid state image pickup device shown in drawing 6 of operation. Operation of the solid state image pickup device shown in drawing 6 is explained referring to drawing 6 and 7.

[0005]Firstin the time T801by inputting a vertical-scanning start pulse into the terminal 2and inputting a vertical scanning pulse into the terminal 3the 1st line is chosen and the signal 20a is set to HIGH (un-illustrating). A HIGH pulse is inputted into the terminal 8 and the floating diffusion region 102 is reset. The terminals 1112and 13 are

simultaneously set to HIGHand the capacitors 108 and 109 are reset. In the time T802when the reset pulse of the terminal 8 changes to LOWthe floating diffusion region 102 will be in a floating state electrically. In the time T803a HIGH pulse is added to the terminal 10a HIGH pulse is simultaneously added also to the terminal 12and the voltage (reset voltage) immediately after reset of the floating diffusion region 102 is read to the capacitor 108. In the time T804a HIGH pulse is added to the terminal 9 and the electric charge generated with the photo-diode 101 is transmitted to the floating diffusion region 102. In the time T805a HIGH pulse is added to the terminal 10 and the terminal 13and the voltage (signal-level + reset voltage) of the floating diffusion region 102 is read to the capacitor 109. In the time T806the voltage of the terminal 14 changes from HIGH to LOWand the level output lines 119 and 120 are reset. Simultaneouslya horizontal scanning start pulse is inputted into the terminal 5a horizontal scanning pulse is inputted into the terminal 6and read-out of the signal from the line memory which consists of a capacitor of each sequence begins. The input signal level to the terminal 14 is moved by the horizontal scanning pulse and an opposite phase in order to prevent interference of the capacitor of each sequence. From the terminal 16the reset voltage of each sequence is outputted one by oneand the sum of the signal level of each sequence and reset voltage is outputted one by one from the terminal 17. By taking the difference of both outputs by the difference means with which the latter part is equippedthe signal level by which the reset voltage which varies between pixels was removed can be obtained. Thereforethe good output of S/N by which the noise component by dispersion in reset voltage was removed can be obtained.

[0006]When the photo-diode 101 is reset when transmission of the electric charge to the floating diffusion region 102 from the photo-diode 101 was performed in the time T804the signal level of the terminal 9 is set to LOW and transmission is completedThe reset is completed and resumes accumulation of the electric charge by the entering light. This accumulation is continued until it becomes the time T804 to the following frame period.

[0007]The signal inputted into the terminals 3891011121356and 14 repeats the pattern from the time T801 to the time T801B the time T801B or subsequent ones. If drawing 8 is also referred toby operation of the vertical scanning circuit 121the signal 20a will be HIGH andin the signal 20bthe signal 20c will become only HIGH and the 3rd line period with HIGH one by one only at the 1st line period only at the 2nd line period. Thereforeby the intervention of the gate group 123in the 1st

line periodthe signal supplied to the terminals 89and 10 becomes effective only in the 1st linebecomes effective only in the 2nd line in the 2nd line periodbecomes effective only in the 3rd line in the 3rd line periodand continues like the following.
[0008]Thereforethe signal outputted from the output terminals 16 and 17 is accumulated in the photo-diode to the timing shifted one by one for every line with a thing. This method is called rolling shutter method.
[0009]Since the floating diffusion region 102 holds the transmitted electric chargea note is madeand it ** and it functionsafter receiving transmission of an electric charge from the photo-diode 101 until it is reset.
[0010]Nextthe conventional example 2 is explained.
[0011]Drawing 9 is a circuit block figure of the solid state image pickup device by the conventional example 2. The explanation which gives the same number to the same portion as the conventional example 1 shown in drawing 6and overlaps is omitted. Although the gate group 123 is expressed with a different signit is the same. In the conventional example 2OR gate 124 is inserted between the output terminal of the element of the gate group 123 which receives the signal from the terminal 9and the gate of the transistor 103 for transmission.
[0012]Drawing 10 is a timing chart of the solid state image pickup device shown in drawing 9 of operation. Operation of the solid state image pickup device shown in drawing 9 is explained referring to drawing 9 and 10.
[0013]In the time T801while a HIGH pulse is impressed to the terminal 8 and the terminal 19 and the floating diffusion region 102 which are all the pixels is resetthe photo-diode 101 of all the pixels is reset. After the end of resetthe accumulation operation of the electric charge by the incident light of the photo-diode 101 of all the pixels begins. In the time T802the seal of approval of the HIGH pulse is again carried out to the terminal 19and the electric charge accumulated with the photo-diode 101 which are all the pixels is transmitted to the floating diffusion region 102. After this HIGH pulse is set to LOWthe electric charge transmitted to the floating diffusion region 102 is held. In the time T803by inputting a vertical-scanning start pulse into the terminal 2and inputting a vertical scanning pulse into the terminal 3the 1st line is chosen and the signal 20a is set to HIGH (un-illustrating). In the time T903a HIGH pulse is impressed to the terminals 1112and 13and the capacitors 108 and 109 are reset. In the time T904a HIGH pulse is impressed to the terminal 10 and the terminal 12and (signal-level + reset voltage) is read from the photo-diode of the floating diffusion

region 102 to the capacitor 110. In the time T905a HIGH pulse is impressed to the terminal 8 and the floating diffusion region 102 is reset. In the time T906a HIGH pulse is impressed to the terminal 10 and the terminal 13and the reset voltage of the floating diffusion region 102 is read to the capacitor 109. In the time T906the voltage of the terminal 14 changes from HIGH to LOWand the level output lines 119 and 120 are reset. Simultaneouslya horizontal scanning start pulse is inputted into the terminal 5a horizontal scanning pulse is inputted into the terminal 6and read-out of the signal from the line memory which consists of a capacitor of each sequence begins. The input signal level to the terminal 14 is moved by the horizontal scanning pulse and an opposite phase in order to prevent interference of the capacitor of each sequence. From the terminal 16the reset voltage of each sequence is outputted one by oneand the sum of the signal level of each sequence and reset voltage is outputted one by one from the terminal 17. By taking the difference of both outputs by the difference means with which the latter part is equippedthe signal level by which the reset voltage which varies between pixels was removed can be obtained. Thereforethe good output of S/N by which the noise component by dispersion in reset voltage was removed can be obtained.

[0014]As for the operation about the 1st line in the period between the time T903 and the time T903Blike the conventional example 1time T903B or below is performed about the 2nd line or below one by oneand the signal of each line is outputted one by one from the output terminals 16 and 17.

[0015]The method of the conventional example 2 is called high speed shutter method.

[0016]

[Problem(s) to be Solved by the Invention]In the conventional example 1when a photographic subject moves at high speedthe contents of the upper part of a picture and the contents of the lower part of a screen shiftand there is a problem that a picture will be distorted. When a photographic subject is irradiated with a strobe light and it is going to carry out speed light photographythere is a problem that the upper part of a screen will differ in the brightness of a photographic subject from the lower part of a screen.

[0017]Although the conventional example 2 solves the two above-mentioned problems of the conventional example 1 by depending the signal of all the pixels on the electric charge accumulated with the photo-diode 101 between the time 301 and the time 302it has a problem which is described below.

[0018]Drawing 11 is a sectional view of each pixel. In a figurea well

and 131 are shields the photo-diode which 101 shows to drawing 9the floating diffusion region which 102 shows to drawing 9the transistor for transmission which shows drawing 9 103and 130. hnu is light. Enters from an oblique direction and some lights which enter into a pixel arrive at the neighborhood and the floating diffusion region 102 of the floating diffusion region 102 of the photo-diode 101 so that it may illustrate. A part of electric charge generated by the light which enters near the floating diffusion region 102 of the photo-diode 101 bypasses the transistor 103 for transmissionand it moves it to the floating diffusion region 102. An electric charge occurs by the light which enters into the floating diffusion region 102. Thereforealso after transmitting an electric charge to the floating diffusion region 102 from the photo-diode 101 in the time 303the electric charge of the floating diffusion region 102 increases with the passage of time. Thereforein the conventional example 2 which reads the stored charge of the floating diffusion region 102 from the pixel of an upper line over one frame time in order of the pixel of a downward line. The noise signal by an above cause became large as it went to the downward lineand the smear had generated it in the picture signal outputted by this.

[0019]It aims at providing the solid state image pickup device with which the contents of the upper part of a picture and the contents of the lower part of a screen do not shifteven when this invention solves the above-mentioned problem and a photographic subject moves at high speed.

[0020]An object of this invention is to provide the solid state image pickup device with which the brightness of the upper part of a screen does not differ from the brightness of the part of a lower screeneven when carrying out speed light photography.

[0021]An object of this invention is to provide the solid state image pickup device which outputs a signal without the smear by change of the electric charge of the floating diffusion region after receiving transmission of the electric charge of a photo-diode.

[0022]An object of this invention is to provide the solid state camera with which the picture signal of the photographic subject only by light-receiving of a strobe light is acquired.

[0023]

[Means for Solving the Problem]A solid state image pickup device by this invention is provided with the following.

A photoelectric conversion means which generates an electric charge by photoelectric conversion from light which received light.

The 1st transfer means that transmits said electric charge generated in

said photoelectric conversion means.
The 1st memory measure that memorizes said transmitted electric chargeand the 1st output means that outputs potential generated in said 1st memory measure by time sharingTwo or more pixel cells provided with an initializing means which initializes voltage of said 1st memory measure to a predetermined valueA means to operate simultaneously said 1st transfer means of two or more of said pixel cellsA means to operate simultaneously said initializing means of two or more of said pixel cellsand two or more 1st output lines that undergo an output of said pixel cell for every sequenceTwo or more 2nd memory measures that corresponded to an effective pixel cell among said two or more pixel cells 1 to 1A control means which controls two or more 2nd transfer means that transmit selectively each signal of two or more of said 1st output lines to each of two or more of said 2nd memory measures for every sequenceand said 1st transfer meanssaid output means and said two or more 2nd transfer means.

[0024]In the above-mentioned solid state image pickup devicesaid 1st transfer means and said initializing means interlockand a solid state image pickup device by this invention initializes an electric charge of said photoelectric conversion means.
[0025]In the above-mentioned solid state image pickup device a solid state image pickup device by this inventionHaving further two or more 2nd output means that output potential of two or more of said 2nd memory measures by time sharingand two or more 2nd output lines that undergo an output of two or more of said 2nd output means for every sequencesaid control means controls further said two or more 2nd output means.
[0026]A solid state image pickup device by this invention equips the above-mentioned solid state image pickup device with the following.
Two or more 3rd memory measures that memorize a signal of two or more of said 2nd output lines.
Two or more 3rd output means that output potential of the 3rd memory measure of this plurality by time sharing.
The 3rd output line that undergoes an output of the 3rd output means of this plurality.

[0027]In the above-mentioned solid state image pickup device a solid state image pickup device by this inventionSaid 3rd memory measure and said 3rd output means in the same sequence Those with two or moreSaid 3rd output line is further provided with two or more 3rd transfer means that transmit selectively each of a signal of those with two or moreand

two or more of said 2nd output lines to each of two or more of said 3rd memory measuresand said control means controls further said two or more 3rd transfer means.
[0028]A solid state image pickup device by this invention is further provided with a difference means to take difference of a signal of two or more of said 3rd output linesin the above-mentioned solid state image pickup device.
[0029]This invention is characterized by a solid state camera comprising the following.
The above-mentioned solid state image pickup device.
Strobe light means.

[0030]A reading solid state camera by this invention is provided with the following.
A sensor part by which a photoelectric conversion pixel was arranged at a multi-line.
A memory part which carried out multi-line arrangement of the accumulation means which accumulates a signal from said photoelectric conversion pixel of a multi-line.
While a picture signal from said photoelectric conversion pixel is outputted from a transfer means which transmits a signal from said sensor part to said memory partand an accumulation means of arbitrary blocks in said memory partA control means to which a noise signal of said photoelectric conversion pixel corresponding to an accumulation means of said arbitrary blocks is made to outputand an elimination means which removes said noise signal from said picture signal.

[0031]
[Embodiment of the Invention][Embodiment 1] Drawing 1 is a circuit block figure of the solid state image pickup device by Embodiment 1. The photo-diode as a photo detector which will generate an electric charge by the light into which 101 entered if a figure is referred toThe transistor for transmission for transmitting the electric charge which generated 102 in the floating diffusion region and generated 103 with the photo-diode 101 to the floating diffusion region 102The transistor for reset for 104 to discharge the electric charge accumulated in the floating diffusion region 102The 1st capacitor for memorizing the voltage which generated 105106and 107 to the transistor for amplifierand generated 108B in the floating diffusion regionThe 2nd capacitor for 109B to memorize the voltage generated in the floating diffusion regionThe transistor for a switch to which 110 connects amplifier and

the capacitor 108BThe transistor for a switch to which 111 connects amplifier and the capacitor 109BThe transistor for capacitor discharge for 112 to make the capacitors 108B and 109B discharge113 and 114 respectively a bufferand 115 and 116 The capacitor 108BThe transistor for reset for the transistor for a switch for switching the voltage of 109B with the capacitor of other sequencesand supplying the buffers 113 and 114and 117 and 118 to reset the input voltage of the buffers 113 and 114 respectivelyand 119 and 120 A level output line. 121 is a vertical scanning circuit and 122 is the 1st horizontal scanning circuit. The amplifier which comprises the transistors 105106and 107 works as source follower type amplifieronly when the transistors 106 and 107 are ON. The photo-diode 101the diffusion floating field 102and the transistors 103104105and 106 form one pixel.

[0032]In this embodimentOR gate 124 is inserted like the conventional example 2 between the output terminal of the element of the gate group 123 which receives the signal from the terminal 9and the gate of the transistor 103 for transmission.

[0033]In this embodimentOR gate 125 is inserted between the output terminal of the element of the gate group 123 which receives the signal from the terminal 8and the gate of the transistor 104 for reset.

[0034]In this embodimentthe buffer 141 with 140 for transfer transistors and output enabling controlthe 2nd vertical scanning circuit 142and the 2nd gate group 143 are added. And between the transfer transistor 140 and the buffer 141the diffusion floating field 144 as a memory of all the pixels is formed.

[0035]Drawing 2 is a block diagram showing the composition of the solid state image pickup device by this embodiment. Compared with the block diagram showing the composition of the solid state image pickup device shown in drawing 1it differs in that the composition of the buffer 141 was shown concretely. In drawing 2the buffer 141 comprises the transistor 141a and the transistor 141b.

[0036]Drawing 3 is a timing chart of the solid state image pickup device shown in drawing 1 of operation. Operation of the solid state image pickup device shown in drawing 1 is explained referring to drawing 1 and 3.

[0037]In the time T101while a HIGH pulse is impressed to the terminal 19 and the terminal 26 and the floating diffusion region 102 which are all the pixels is resetthe photo-diode 101 of all the pixels is reset. After the end of resetthe accumulation operation of the electric charge by the incident light of the photo-diode 101 of all the pixels begins. In the time T102the seal of approval of the HIGH pulse is again carried out to

the terminal 19and the electric charge accumulated with the photo-diode 101 which are all the pixels is transmitted to the floating diffusion region 102. In the time T103by inputting a vertical-scanning start pulse into the terminal 2 and the terminal 25and inputting a vertical scanning pulse into the terminal 3 and the terminal 21the 1st line is chosen and the signals 20a and 26a are set to HIGH (un-illustrating). In the time T104a HIGH pulse is impressed to the terminal 10 and the terminal 24and the voltage of an intermediary's diffusion stray capacitance 102 is transmitted to the diffusion stray capacitance 143 at the 1st line currently held. The signal 20b and the signal 26b serve as HIGH from the time T105and transmission of voltage to the diffusion region 143 from the diffusion stray capacitance 102 about the 2nd line is performedand from the time T106The signal 20c and the signal 26c serve as HIGHand transmission of voltage to the diffusion region 143 from the diffusion stray capacitance 102 about the 3rd line is performed.

[0038]When this transmission is completedtransmission of the voltage from the diffusion stray capacitance 102 about all the pixels to the diffusion stray capacitance 143 is completed. Since this transmission is not accompanied by the horizontal transmission for taking out an output signal from the terminals 16 and 17it is performed for a short time.

[0039]Nextin the time T107by inputting a vertical-scanning start pulse into the terminal 2 and the terminal 25and inputting a vertical scanning pulse into the terminal 3 and the terminal 21the 1st line is chosen and the signals 20a and 26a are set to HIGH (un-illustrating). Simultaneouslythe seal of approval of the HIGH pulse is carried out to the terminal 8and the floating diffusion region 102 which is the 1st line is reset. In the time T108a HIGH pulse is impressed to the terminals 1112and 13and the 1st capacitor 108B and 2nd capacitor 109 are reset. In the time T109voltage ** which applied the voltage of the floating diffusion region 144 to the 1st capacitor 108B and by which the HIGH pulse was impressed to the terminals 12 and 23and it applied reset voltage to the signal level is read. In the time 110a HIGH pulse is impressed to the terminals 10 and 24and the voltage of the floating diffusion region 102 is transmitted to the floating diffusion region 144. The voltage of the floating diffusion region 102 at this time is reset voltage which a smear is hardly mixing for the reason soon after after reset. In the time 111a HIGH pulse is impressed to the terminals 13 and 23and the voltage of the floating diffusion region 144i.e.reset voltage **is read to the 2nd capacitor 109B. In the time T112the voltage of the terminal 14 changes from HIGH to LOWand the level output lines 119 and 120 are reset. Simultaneouslya horizontal scanning start pulse is

inputted into the terminal 5a horizontal scanning pulse is inputted into the terminal 6and read-out of the signal from the line memory which consists of a capacitor of each sequence begins. The input signal level to the terminal 14 is moved by the horizontal scanning pulse and an opposite phase in order to prevent interference of the capacitor of each sequence. From the terminal 16the sum of the signal level of each sequence and reset voltage is outputted one by oneand the reset voltage of each sequence is outputted one by one from the terminal 17. By taking the difference of both outputs by the difference means 126 with which the latter part is equippedthe signal level by which the reset voltage which varies between pixels was removed can be obtained. Thereforethe good output of S/N by which the noise component by dispersion in reset voltage was removed can be obtained.

[0040]After the time T107Bone by onethe signals 20b and 26b and the signals 20c and 26c are set to HIGHand operation from the time T107 performed about the 1st line by operation of the gate group 123 and the gate group 143 to the time 107B is succeedingly performed about the 2nd line and the 3rd line.

[0041]Take the same time as the usual frame read-out until outputting the signal of the 3rd line from the terminals 16 and 17 is completedafter starting outputting the signal of the 1st line from the terminals 16 and 17but. Since light does not leak to the floating diffusion region 144 and the floating diffusion region 144 is formed in well with the another photo-diode 101the voltage of the floating diffusion region 144 is held without changing. Thereforethe signal with which a smear is not contained is outputted from the terminal 16.

[0042]Since it is horizontally read after the reset voltage of the pixel of each line is also transmitted to the floating diffusion region 144 immediately after resetting the floating diffusion region 102 for every linethe signal with which a smear is not contained is outputted from the terminal 17.

[0043]The output signal from the terminal 16 and the output signal from the terminal 17 are inputted into a differential circuit (un-illustrating). Thereforethe reset voltage which varies between pixels is lost and the generating picture signal with which a smear is not contained can be acquired from the output terminal of a differential circuit.

[0044]The read method of the signal of the floating diffusion region 144 has other methodssuch as the method of readingfor example by a 2 pixels long and 2 pixels wide two-dimensional block unit besides the method which it reads one line at a time using the line memory of this

embodiment.
[0045][Embodiment 2] The composition of the solid state image pickup device in Embodiment 2 is the same as the composition of the solid state image pickup device in Embodiment 1 shown in drawing 1. Embodiment 2 differs in Embodiment 1a useand operation timing.
[0046]Drawing 4 is a timing diagram showing the operation timing of the solid state image pickup device in this embodiment. The explanation which overlaps since the operation from the time T201 of this embodiment to the time 206 is the same as the operation from the time T101 of Embodiment 1 to the time 106 is omitted. Howeverthe photographic subject picturized from the time T201 before the time 202 is used as the 1st photographic subject.
[0047]An image sensor picturizes the 2nd photographic subject from the time T207 before the time T208. Namelyin [in the time T207a HIGH pulse is impressed to the terminal 19 and the terminal 26and the floating diffusion region 102 and the photo-diode 101 are resetand] the time 208A HIGH pulse is impressed to the terminal 19 and the signal by the picture picturized from the time T207 before the time 208 is transmitted to the floating diffusion region 102.
[0048]Nextin the time T209by inputting a vertical-scanning start pulse into the terminal 2 and the terminal 25and inputting a vertical scanning pulse into the terminal 3 and the terminal 21the 1st line is chosen and the signals 20a and 26a are set to HIGH (un-illustrating). In the time T210a HIGH pulse is impressed to the terminals 1112and 13and the 1st capacitor 108B and 2nd capacitor 109 are reset. In the time T211a HIGH pulse is impressed to the terminals 12 and 23and voltage ** which applied reset voltage to the voltage of the floating diffusion region 144i.e.the signal level by the 1st photographic subjectis read to the 1st capacitor 108B. In the time 212a HIGH pulse is impressed to the terminals 10 and 24and the voltage of the floating diffusion region 102 is transmitted to the floating diffusion region 144. The voltage of the floating diffusion region 102 at this time is the voltage which applied reset voltage to the signal level by the 2nd photographic subject that a smear is hardly mixing for the reason soon after after reset. In the time 213a HIGH pulse is impressed to the terminals 13 and 23and voltage ** which applied reset voltage to the signal level by the 2nd photographic subject that the voltage of the floating diffusion region 144i.e.a smearis hardly mixing in the 2nd capacitor 109B is read. In the time T214the voltage of the terminal 14 changes from HIGH to LOWand the level output lines 119 and 120 are reset. Simultaneouslya horizontal scanning start pulse is inputted into the terminal 5a horizontal

scanning pulse is inputted into the terminal 6and read-out of the signal from the line memory which consists of a capacitor of each sequence begins. The input signal level to the terminal 14 is moved by the horizontal scanning pulse and an opposite phase in order to prevent interference of the capacitor of each sequence. From the terminal 16the voltage which applied reset voltage to the signal level by the 1st photographic subject of each sequence is outputted one by oneand the voltage which applied reset voltage to the signal level by the 2nd photographic subject of each sequence is outputted one by one from the terminal 17. By taking the difference of both outputs by the difference means 126 with which the latter part is equippedthe signal level which deducted the signal level by the 2nd photographic subject from the signal level by the 1st photographic subject can be obtained. The signal level which deducted the signal level by the 1st photographic subject from the signal level by the 2nd photographic subject can be obtained by reversing the polarity of the difference means 126. Thereforethe good output of S/N by which the noise component by dispersion in reset voltage was removed can be obtained.

[0049]After the time T209Bone by onethe signals 20b and 26b and the signals 20c and 26c are set to HIGHand operation from the time T209 performed about the 1st line by operation of the gate group 123 and the gate group 143 to the time 209B is succeedingly performed about the 2nd line and the 3rd line.

[0050]By carrying out a strobe lightwhen the imaging device provided with the solid state image pickup device by this embodiment is provided with a stroboscope and photos the 1st photographic subjectand deducting the signal of the 2nd photographic subject from the signal of the 1st photographic subject by the difference means 126The picture signal which deducted the brightness of the photographic subject which carried out outdoor daylight photography from the brightness of the photographic subject which carried out speed light photography can be acquired. Dispersion in reset voltage is offset and the noise by dispersion in reset voltage is not mixing this picture signal.

[0051]By carrying out a strobe lightwhen the imaging device provided with the solid state image pickup device by this embodiment is provided with a stroboscope and photos the 2nd photographic subjectand deducting the signal of the 1st photographic subject from the signal of the 2nd photographic subject by the difference means 126The picture signal which deducted the brightness of the photographic subject which carried out outdoor daylight photography from the brightness of the photographic subject which carried out speed light photography can be acquired.

Dispersion in reset voltage is offset and the noise by dispersion in reset voltage is not mixing this picture signal.
[0052][Embodiment 3] Embodiment 3 shows various embodiments of the composition of each pixel of a solid state image pickup device. Drawing 5 is a representative circuit schematic showing the composition of the pixel by Embodiment 3.
[0053]The pixel shown in drawing 5 (a) is the same as the pixel by Embodiments 1 and 2. The photo-diode and all the transistors of this pixel are a N-MOS type.
[0054]As for the pixel shown in drawing 5 (b)the transistor 106 is transposed to the transistor 105b. This carries out the same operation as the pixel of drawing 5 (a).
[0055]As for the pixel shown in drawing 5 (c)the transistor 104 is deleted. In the case of this pixelthe floating diffusion region as a memory is not formed.
[0056]The photo-diode and all the transistors of the pixel shown in drawing 5 (d) are a P-MOS type. This can be seen as what the polarity of the pixel shown in drawing 5 (a) reversed.
[0057]The pixel shown in drawing 5 (e) transposes the photo-diode of the pixel shown in drawing 5 (a) to a photogate. Accumulation/read-out of the photo carrier (electric charge) of a photogate are controlled by gate voltage.
[0058]
[Effect of the Invention]Since all the pixels form the picture signal from the light which received light at the same time according to this invention as explained aboveeven when a photographic subject moves at high speedthe contents of the upper part of a picture and the contents of the lower part of a screen do not shift.
[0059]According to this inventionsince all the pixels form the picture signal from the light which received light at the same timeeven when carrying out speed light photographythe brightness of the upper part of a screen does not differ from the brightness of the part of a lower screen.
[0060]The electric charge of the photo-diode which was transmitted to the floating diffusion region contiguous to a photo-diode according to this inventionSince it is transmitted to a memory at high speed before outputting a picture signala signal without the smear by change of the electric charge of the floating diffusion region after receiving transmission of the electric charge of a photo-diode can be outputted.
[0061]According to this inventionsince the picture signal which deducted the picture signal of the photographic subject when having received only

outdoor daylight from the picture signal of the photographic subject when having received the strobe light in addition to outdoor daylight is acquiredthe picture signal of the light-receiving **** photographic subject of only a strobe light is acquired.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram showing the composition of the solid state image pickup device by Embodiment 1 of this invention.
[Drawing 2]It is a block diagram showing the composition of the solid state image pickup device by Embodiment 1 of this invention.
[Drawing 3]It is a timing chart which shows the operation timing of the solid state image pickup device by Embodiment 1 of this invention.
[Drawing 4]It is a timing chart which shows the operation timing of the solid state image pickup device by Embodiment 2 of this invention.
[Drawing 5]It is a representative circuit schematic of the pixel of the solid state image pickup device by Embodiment 3 of this invention.
[Drawing 6]It is a block diagram showing the composition of the solid state image pickup device by the conventional example 1.
[Drawing 7]It is the 1st timing chart that shows the operation timing of the solid state image pickup device by the conventional example 1.
[Drawing 8]It is the 2nd timing chart that shows the operation timing of the solid state image pickup device by the conventional example 1.
[Drawing 9]It is a block diagram showing the composition of the solid state image pickup device by the conventional example 2.
[Drawing 10]It is a timing chart which shows the operation timing of the solid state image pickup device by the conventional example 2.
[Drawing 11]They are some sectional views of the pixel in this invention and a conventional example.
[Description of Notations]
101 Photo-diode
102 and 144 Floating diffusion region
103 The transistor for transmission
104 The transistor for reset
105106the transistor for 107 amplifier
108B and 109B Capacitor
110 and 111 Transistor for a switch
112 The transistor for capacitor discharge
113 and 114 Buffer

115 and 116 Transistor for a switch
117 and 118 Transistor for reset
119 and 120 Level output line
121142 Vertical scanning circuit
122 Horizontal scanning circuit
123143 gate groups
140 The transistor for transmission
141 Buffer